

BSC. PART - II EXAMINATION - 2008

PHYSICS HONOURS PAPER IV

Answer Q. No 1 which is compulsory and two each from Group - A and Group -B

1. Choose the correct answer from the given alternatives

(a) The damping torque on the moving part of a galvanometer

- (i) Is constant (ii) Is proportional to the angular displacement
(iii) Is proportional to the angular velocity
(iv) Is proportional to the angular acceleration

(b) The quality factor of an LCR circuit subjected to alternating current of cyclic frequency ω is (i) $\omega C/L$ (ii) $L/\omega C$ (iii) $\omega L/R$ (iv) $R/\omega L$

power factor is: (i) $\frac{P_1}{P_2}$ (ii) $\frac{P_2}{P_1}$ (iii) $(P_1 + P_2)$ (iv) $(P_1 - P_2)$

(d) The Poynting vector of an electromagnetic field is

- (i) $\vec{E} \times \vec{H}$ (ii) $\vec{H} \times \vec{E}$ (iii) $\vec{E} + \vec{H}$ (iv) $\vec{E} - \vec{H}$

(c) Lorentz gauge transformation is given by

- (i) $\text{div } \phi = -\frac{\partial \Lambda}{\partial t}$ (ii) $\text{div } \phi = \frac{\partial \Lambda}{\partial t}$ (iii) $\text{Grad } \phi = \frac{\partial \Lambda}{\partial t}$ (iv) None of these

(f) Which of the following is true

- (i) $\text{curl } \vec{B} = 0$ (ii) $\text{div } \vec{B} = 0$ (iii) $\text{curl } E = 0$ (iv) None of these

(g) Absorption of U.V. radiation by a diatomic molecule results in the transition of (i) Electronic energy level (ii) Vibrational energy level

- (iii) Rotational energy level (iv) None of these

(h) Raman effect is (i) Reflection of light (ii) Refraction of light
(iii) Scattering of light (iv) Dispersion of light

(i) The energy of an electron in the n th orbit varies as

- (i) n (ii) $\frac{1}{n^2}$ (iii) $\frac{1}{n}$ (iv) n^2

(j) The existence of discrete energy levels is shown by

- (i) Stern-Gerlach experiment (ii) Frank-Hertz experiment
(iii) Thomson's experiment (iv) Bate's experiment

GROUP - A

2. What are Peltier and Thomson effects? Prove the following :

(a) $\Pi = T \frac{dE}{dT}$ (b) $\sigma_A - \sigma_B = -T \frac{d^2E}{dT^2}$

3. Discuss the theory of discharge of a condenser through an inductance and a resistance. In what condition the discharge is oscillatory in nature?

4. Give a brief account of emission and absorption spectra of x-rays.

5. Mention different quantum numbers of an atom. How these quantum numbers interpret the configuration of the atom?

GROUP - B

6. Express Maxwell's field equations in terms of scalar and vector potentials. Show that \vec{E} and \vec{B} are invariant under Gauge transformations.
7. Discuss the propagation of plane electromagnetic waves in a conducting medium and show that the wave penetrates the conducting medium to a certain depth.
8. Prove the laws of reflection and refraction of light on a plane surface on the basis of electromagnetic theory.
9. Outline the theory of vibration-rotation spectrum of a diatomic molecule. How does the presence of isotopes affect the spectrum?

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